United States Court of Appeals

For the Ninth Circuit

No. 22495

PROLER STEEL CORPORATION, INC.,

Plaintiff-Appellant,

v.

LURIA BROTHERS & COMPANY, INC., and
LIPSETT STEEL PRODUCTS, INC.,

Defendants-Appellees.

APPENDIX TO DEFENDANTS-APPELLEES' BRIEF

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APPENDIX TO DEFENDANTS-APPELLEES' BRIEF

Chart Comparing Claim 9 of Proler Reissue Patent, the Proler Process, Appellees' Noninfringing Process Until April 1965 and Appellees' Accused Process After April 1965

(See Opposite ☞)

CLAIM 9 OF THE PROLER PATENT

Step 1:

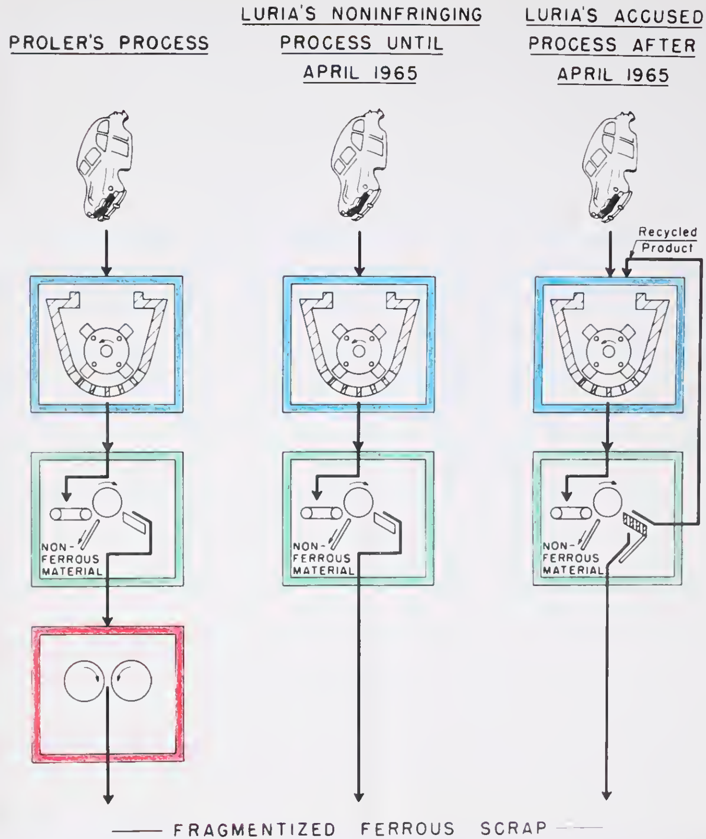
Shredding the raw material

Step 2:

Separating the more ferrous bearing shredded material from the less ferrous bearing shredded material

Step 3:

Individually compacting and balling up the pieces of the more ferrous bearing shredded material to densify it while maintaining the individuality of the separate pieces



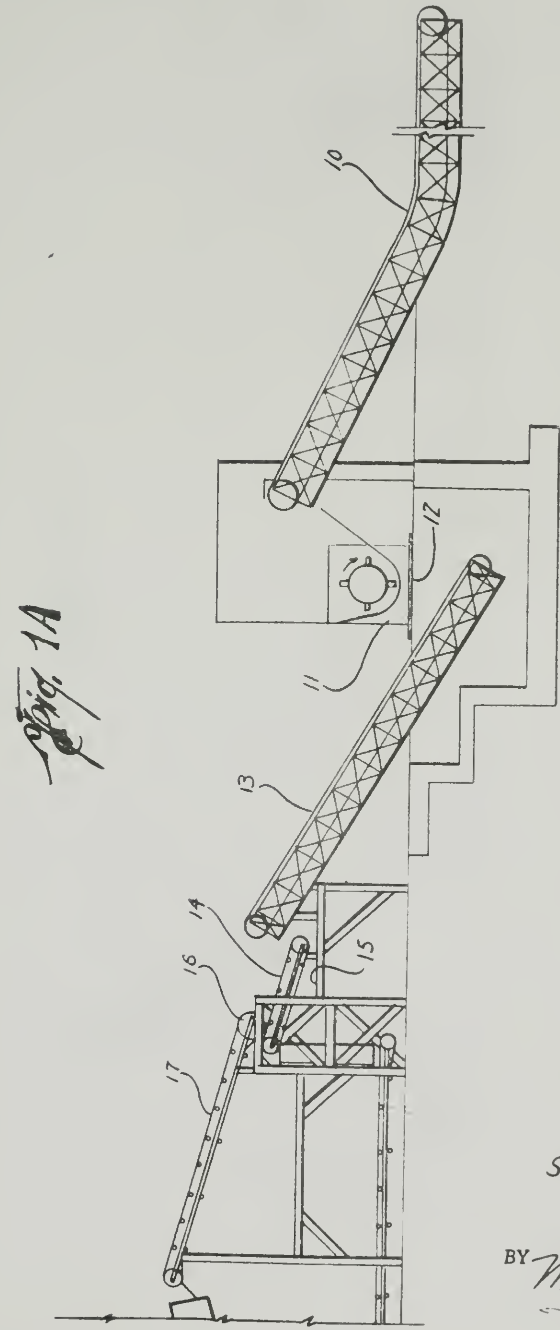
Proler Reissue Patent Re. 25,034

(See Opposite ☞)

Aug. 29, 1961 S. PROLER Re. 25,034

SCRAP REFINING PROCESS AND PRODUCT

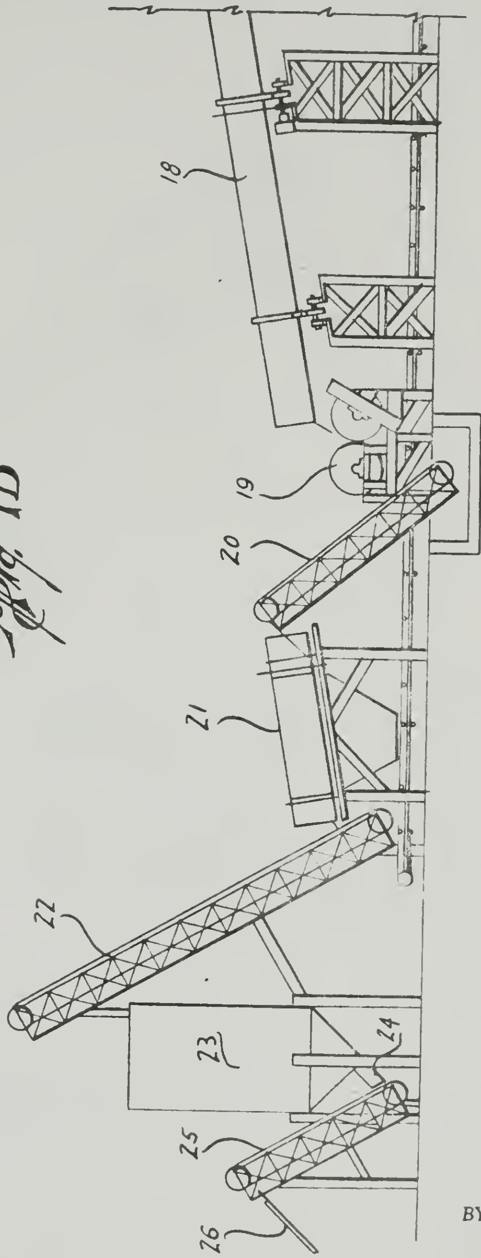
Original Filed Aug. 12, 1957 3 Sheets-Sheet 1



Sam Proler
INVENTOR.

BY Murray Robinson
ATTORNEY

Fig. 1B



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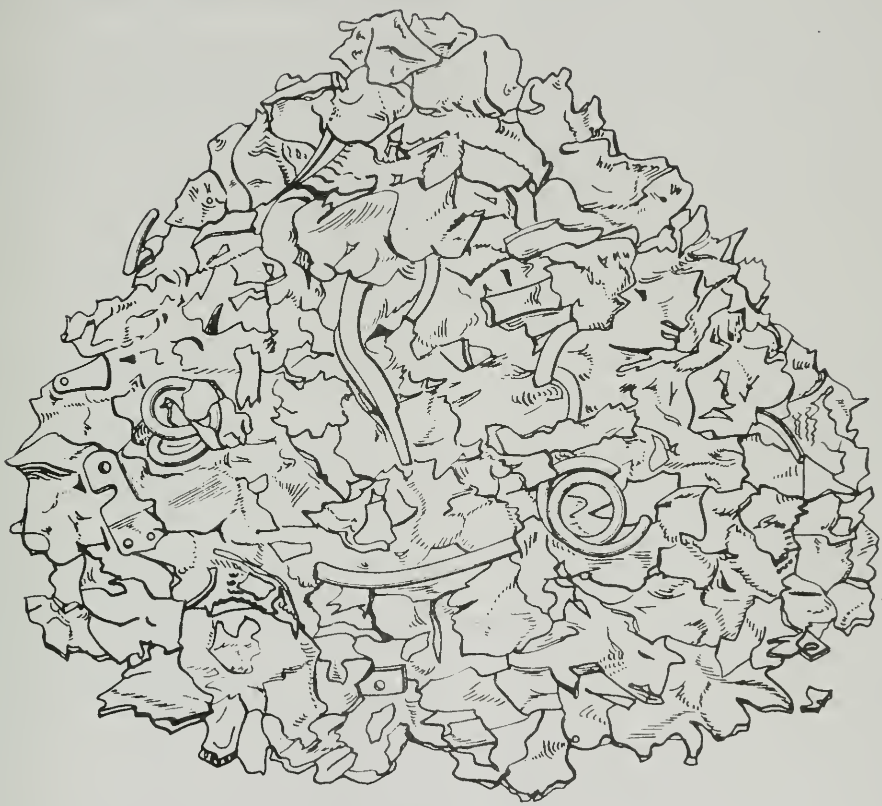

Fig. 2

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INVENTOR.

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United States Patent Office

Re. 25,034
Reissued Aug. 29, 1961

25,034

SCRAP REFINING PROCESS AND PRODUCT

Sam Proler, Houston, Tex., assignor to Proler Steel Corporation, Houston, Tex., a corporation of Texas

Original No. 2,943,930, dated July 5, 1960, Ser. No. 849,116, Oct. 27, 1959, which is a continuation of Ser. No. 677,514, Aug. 12, 1957. Application for reissue Dec. 5, 1960, Ser. No. 73,930
10 Claims. (Cl. 75—44)

Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue.

This invention pertains to refined scrap and a method of making same; more particularly it pertains to a process of upgrading contaminated ferrous scrap to make a product more suitable for charging directly or indirectly into a furnace for making iron or steel such as an open hearth furnace, blast furnace, electric furnace, cupola type furnace, for example. This application is a continuation of Serial No. 677,514, filed August 12, 1957, now abandoned.

A particular object of the invention is to convert material heretofore suitable only for making what is known in the trade as a number 2 or number 3 scrap bale into a material equivalent or superior to a number 1 bale of scrap.

A further object of the invention is to effect such a conversion at a cost that is low enough to effect an overall saving in the cost of steel production compared to the use of number 1 scrap bales.

A further object of the invention is to produce a flowable material, analogous to graded hard coal or rock, which can readily be handled by conventional continuous conveyors such as augers or buckets or belts, as distinguished from unitized bales requiring individual handling.

Other objects and advantages of the invention will appear from the following description thereof.

According to a preferred method embodying the invention an appropriate raw material is reduced to a proper size by milling it up until it is cut to a size that will pass a grate having openings somewhat less than a foot square, the resulting shredded material is magnetically separated, the separated more ferrous material is purified by counterflowing it through a rotary kiln heated to about 1300° to 1800° F. at the exhaust end to melt and burn off adhered non-ferrous material, and the resulting clean scrap is compacted while still hot by rolling extrusion. The term "non-ferrous" is used in its broad sense, meaning any material that is not ferrous, whether metallic or not, and covering for example everything from brass to grass, from grease to concrete.

For a more detailed description of the invention reference will now be made to the accompanying drawings wherein:

FIGURES 1A and 1B together constitute a semi-schematic layout of apparatus suitable for carrying out the method of the invention; and

FIG. 2 depicts a pile of scrap material made according to the invention.

Referring now to FIGURE 1, the apparatus there shown will be described in order of its operation on the material. An appropriate raw material is placed on apron conveyor **10** at the lower end thereof and carried up to the upper end. An appropriate raw material is any kind of scrap including a goodly proportion (preferably at least about 50% by weight) of heavy gage (28 gage and over) ferrous sheet steel, flat or shaped, such as complete automobiles with or without engines, ice boxes, stoves, washing machines, refrigerators, steel desks, hot water heaters, toys, bicycles, and appliances and parts thereof. Steel in

non-sheet form such as wire, rods, shafts, bars, plates, and structural forms may also be present although the more usual raw material will contain less of such material and more of the previously mentioned type for the reason that the latter is usually sufficiently clean to be manually separated and made into a number 1 bale without further treatment. Cast iron and tin plate are undesirable and should not be present in excess of about 5% by weight.

The raw scrap falls off the upper end of the conveyor into the mouth of a reducing means **11** which is preferably of the type known as a hammer mill. There the sheet metal is largely cut and shredded and the other material is cut and shredded and broken until the material is small enough to pass through the openings in grate **12**. The openings in grate **12** may be rectangular in shape, preferably having dimensions of 6" by 10", although openings having any shape and a maximum dimension up to 12" are contemplated.

The reduced material falls through grate **12** onto the lower end of apron conveyor **13** and is carried to the upper end thereof where it falls off into a picking belt **14**. An operator standing nearby on platform **15** removes from belt **14** such material as is obviously undesirable such as pieces which might interfere with subsequent operations. Also any particularly valuable nonferrous scrap piece may be removed at this point. The picked over material is carried by belt **14** to magnetic pulley **16** where the more ferrous material is caught and carried up onto belt **17** while the non magnetic material passes under pulley **16** and drops off the end of belt **14**. By means of this manual and magnetic separation the free more ferrous scrap is thus separated out from the reduced scrap coming from the hammer mill. Any suitable magnetic separator can be used.

The reduced separated more ferrous scrap falls off the upper end of belt **17** into the upper end of rotary furnace **18** where it is roasted to separate the adhered non-ferrous material from the ferrous. This furnace may be smooth on the interior as in a calcining kiln but preferably is provided with lifting flights as in a dryer so as to tumble the material more effetcively as it is roasted. The furnace is preferably heated by a gas burner at its lower end with the material flowing down through the furnace countercurrent to the hot gas flowing upwardly therethrough in direct contact therewith. A temperature at the burner end of 1300 to 1800 degrees F. is suitable for burning off paper, wood, grease, oil, paint, rubber and other combustibles, melting off tin and lead and other non-ferrous coatings, and cracking off various porcelain and other stone-like finishes.

If desired, the roasted material can next be trommeled to separate the clean ferrous scrap from the freed nonferrous solid material. However most of the adhered non-ferrous material freed in the roasting operation will be either liquified or volatilized and escape without special attention. Therefore the roasted material can be fed directly from the furnace to rolling mill **19**. This is preferable because the material will be hotter if fed directly to the rolling mill.

In mill **19** the hot roasted clean scrap is compacted so that the component pieces are to a certain extent balled up with the result that a somewhat flowable, i.e. only loosely cohering material results. The compacting increases the density of the product from the order of about 25 pounds per cubic foot to the order of about 50 pounds per cubic foot resulting not only in a space saving in transportation but a reduction in the volatilization loss when the material is charged into a steel furnace.

After passing through the compacting rolls the material falls onto the lower end of conveyor **20** which carries it up to the mouth of a rotary screen **21** where it is trommeled. The screen preferably has apertures of

about ¼" maximum dimension. As the material descends through the trommel toward its lower end, any remaining fine material freed in the roasting or compacting operations, such as oxides, falls through the holes in the screen away from the main body of the scrap. The trommeling inherently shakes and jars the scrap so as to remove further loosely adhering particles.

If desired the output from the rotary screen can be subjected to a further magnetic separation but it is believed that this will usually be unnecessary and the material falling out of the rotary screen preferably is carried by a conveyor **22** directly to a railroad car or to a storage hopper **23**. As desired the final product can be removed from the bottom of the hopped by opening a gate in the outlet **24** thereof whereby the material will be discharged onto the lower end of conveyor **25**. The material will be deposited by conveyor **25** into chute **26** leading to a railroad car, truck, or other transportation device.

The product resulting from the above described process is shown in FIGURE 2. It is a high quality material suitable for charging all types of steel furnaces. By virtue of the process it is substantially free of loose and adhered nonferrous material and has a maximum piece dimension less than one foot with the possible exception of a few bars which may have escaped cutting into shorter lengths in the hammer mill and gone through its grate end-wise. It will have a density of at least 50 pounds per cubic foot and usually more in the vicinity of 60 pounds per cubic foot or even higher. By virtue of the choice of feed material, the minimum dimension of the product is not less than 28 gage, i.e. 0.0149 inch. Also, by excluding a majority of plated products such as tin cans the product will be substantially free of absorbed non-ferrous material. In summary, by use of a suitable raw material and the process according to the invention there is produced at low cost a refined scrap material product that is comparable or superior to number 1 scrap bales for which there is great demand as a furnace charging material. The material is suitable for either direct feed into a steel furnace, or into hot metal from a blast furnace or into a blast furnace directly along with the ore to increase the yield. It is suitable for use in all types of furnaces.

While a preferred embodiment of the invention has been shown and described, many modifications thereof can be made by one skilled in the art without departing from the spirit of the invention and it is desired to protect by Letters Patent all forms of the invention falling within the scope of the following claims:

1. Process of refining a raw ferrous bearing scrap material comprising shredding the raw material, separating the more ferrous bearing shredded material from the less ferrous bearing shredded material, roasting the more ferrous bearing shredded material at a temperature sufficient to remove substantially all non-ferrous metals, and individually compacting and balling up the pieces of the more ferrous bearings shredded material to densify it while maintaining the individuality of the separate pieces, whereby a fluent mass is obtained.

2. The product of the process of claim 1.

3. Process of upgrading junkyard type raw ferrous scrap such as automobiles to a fluent bulk furnace charging material comprising milling the raw scrap to a reduced piece size, magnetically separating the more ferrous milled scrap from the less ferrous milled scrap, roasting the more ferrous milled scrap at a temperature sufficient to separate substantially all adhered non-ferrous materials, and individually compacting and balling up the pieces of the roasted ferrous scrap while below the welding temperature of steel to densify the roasted ferrous scrap while maintaining the individuality of the separate pieces sufficient to keep the final product fluent.

4. Process of upgrading junkyard type raw ferrous scrap such as automobiles, having at least a large proportion of sheet material of at least 28 gage and no more than a small proportion of plated material, to a fluent bulk furnace charging material comprising cutting, shredding, and breaking the raw scrap to a reduced piece size, magnetically separating the more ferrous pieces of scrap from the less ferrous pieces of scrap, roasting the more ferrous pieces of scrap at a temperature sufficient to burn, melt, evaporate, and crack off substantially all adhered non-ferrous materials, and separately compacting and balling up the individual pieces of the roasted scrap while below the welding temperature for steel to densify the bulk roasted scrap while maintaining the individuality of the separate pieces sufficient to keep the final product fluent.

5. A process as defined by claim 4, wherein the magnetic separation step is repeated after the roasting step.

6. Process of refining a raw ferrous bearing scrap material comprising reducing the piece size of the raw material, separating the more ferrous pieces of material from the less ferrous pieces of material, roasting the more ferrous pieces of material at a temperature sufficient to separate substantially all adhered non-ferrous materials from the ferrous pieces, and separately passing the individual ferrous pieces through a rolling mill.

7. Process as defined by claim 6 wherein a fluent mass having a density of at least about 50 pounds per cubic foot is formed.

8. Process of upgrading junkyard type raw ferrous scrap such as automobiles, having at least a large proportion of sheet material of at least 28 gage and no more than a small proportion of plated material, to a fluent bulk furnace charging material, comprising milling the raw scrap to a piece size small enough to pass a grate of no larger than one foot opening size, magnetically separating the more ferrous milled scrap from the less ferrous milled scrap, roasting the more ferrous milled scrap at a temperature in the range of 1300 to 1800 degrees F., and individually compacting and balling up the pieces of the roasted scrap while below the welding temperature for steel to increase the density of the bulk roasted scrap while maintaining the individuality of the separate pieces sufficient to keep the final product fluent.

9. Process of refining a raw ferrous bearing scrap material comprising shredding the raw material, separating the more ferrous bearing shredded material from the less ferrous bearing shredded material, and individually compacting and balling up the pieces of the more ferrous bearing shredded material to densify it while maintaining the individuality of the separate pieces, whereby a fluent mass is obtained.

10. Process of refining a raw ferrous bearing scrap material comprising shredding the raw material, separating the more ferrous bearing shredded material from the less ferrous bearing shredded material, and separately passing the pieces of the more ferrous bearing shredded material individually through a rolling mill.

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Gregg United States Letters Patent No. 2,059,229

(See Opposite ☞)

Nov. 3, 1936. C. M. GREGG 2,059,229

METHOD OF PREPARING DISCARDED AUTOMOBILE FENDERS AND SIMILAR MATERIALS FOR MELTING PURPOSES

Filed Aug. 19, 1935

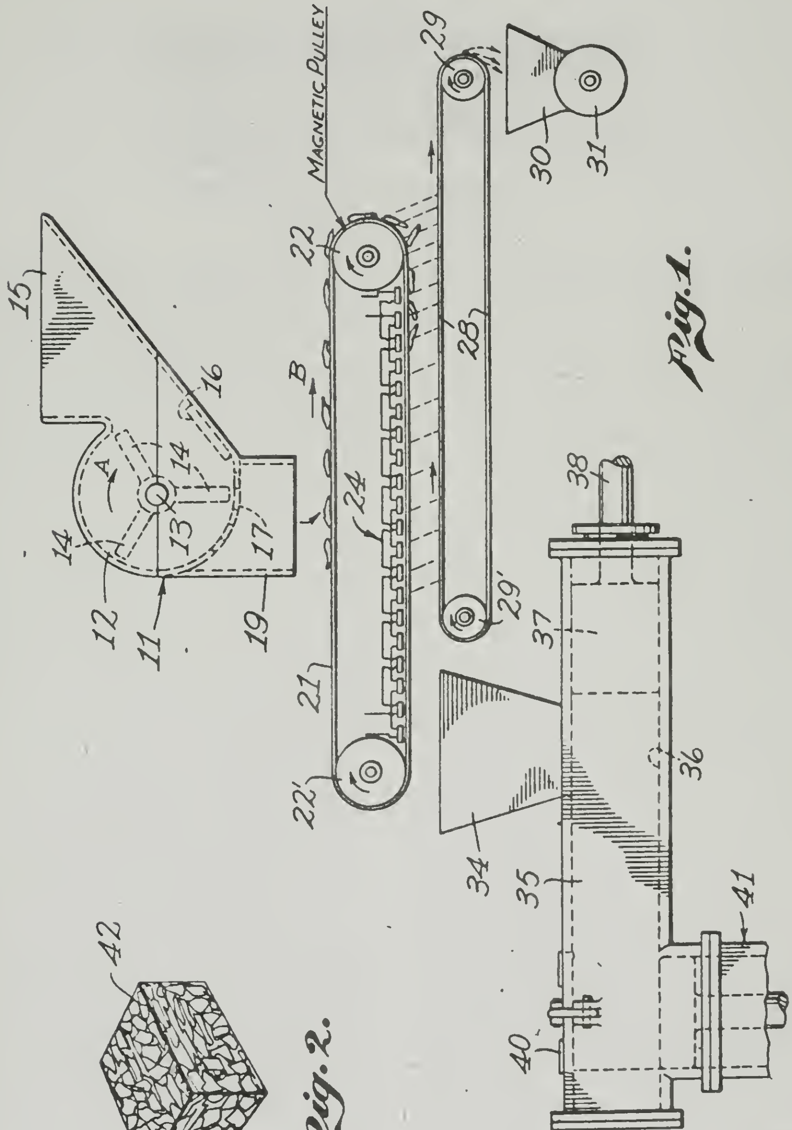


Fig. 1.

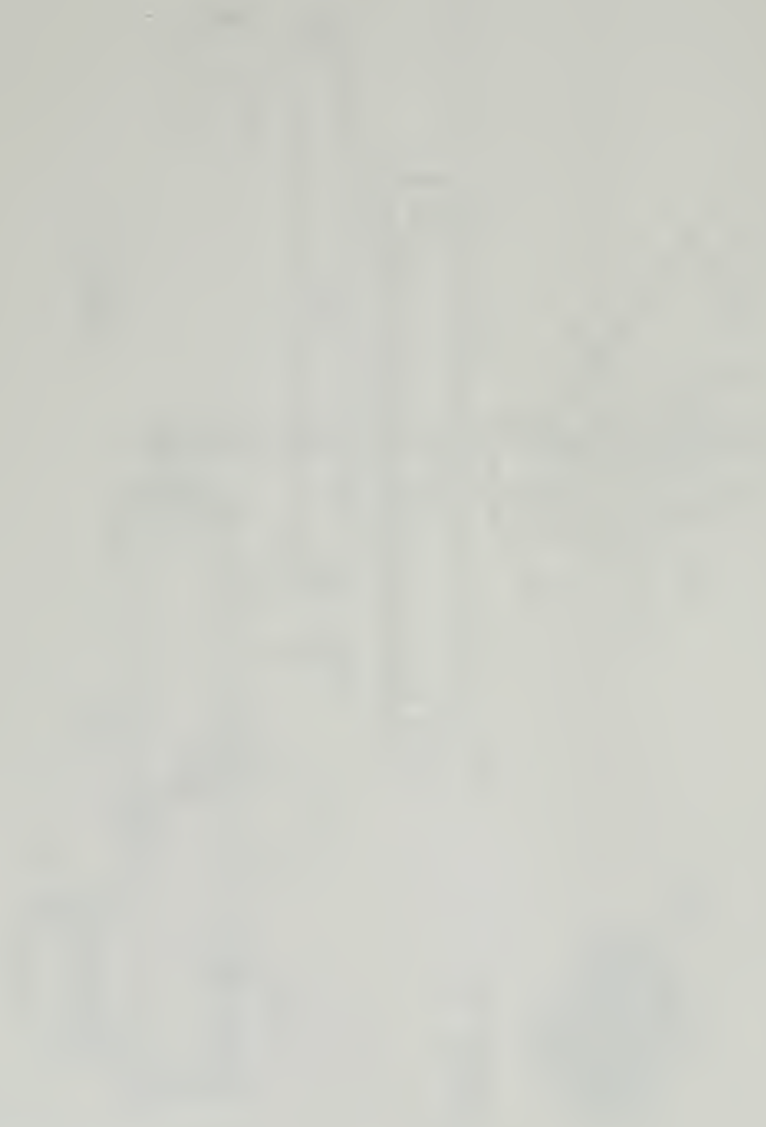
Fig. 2.

Inventor

Clarence M. Gregg

By [signature]

Attorney



UNITED STATES PATENT OFFICE

2,059,229

METHOD OF PREPARING DISCARDED AUTOMOBILE FENDERS AND SIMILAR MATERIALS FOR MELTING PURPOSES

Clarence M. Gregg, Los Angeles, Calif., assignor to Los Angeles By-Products Co., a corporation of California

Application August 19, 1935, Serial No. 36,864

3 Claims. (Cl. 29—160.5)

This invention has to do in a general way with the manufacture of iron and steel and is more particularly related to an improved process for preparing scrap iron or scrap steel for use as a raw material in the manufacture of steel.

As is well known to those familiar with the art, scrap iron has long formed one of the sources of raw material for the steel industry. Although part of this scrap iron is obtained from refuse and cuttings from foundries, machine shops, sheet metal works, etc., a large proportion of the scrap is obtained from city dumps and junk yards where it is associated with a great deal of non-ferrous material of both metallic and non-metallic nature. This latter type of scrap iron due to the large amount of dirt and foreign matter which it contains, commands a much lower price than "clean" scrap of the type first referred to above, due, first, to the increased cost of handling a given weight of iron as a result of the large amount of foreign material which contaminates the iron, and second, to the fact that the contaminating material results in the production of an inferior product. This latter factor is especially true when the scrap iron contains foreign materials of metallic nature, such as brass, copper, zinc, pewter, etc., and also in the event it is to be used in an open-hearth process where the operators, in order to obtain the desired results, try to avoid as much of the slag as possible.

The process of this invention is primarily concerned with the last mentioned type of scrap and has as its primary object the production from scrap metal such as is obtained from city dumps, junk yards and the like, a clean high-grade scrap iron or melting bale from which all of the non-ferrous material has been removed and which will command a price from the market and will produce a product equal to the finest grade of scrap iron.

Another difficulty which is encountered in the use of ordinary scrap iron resides in the bulkiness and the difficulty with which it is handled, and my invention further contemplates the production of scrap iron of the class described in bales or units of convenient size and very high density so that they may be handled and shipped at minimum cost. Another factor of even greater importance resides in the fact that sheet metal such as is found in discarded automobile fenders and bodies, normally presents a very great surface to oxidation, which is not materially diminished by the usual method of battering and bundling as now practiced. In the process contemplated by this invention, the metal is so compressed and baled as to present a minimum surface for oxidation, thereby reducing materially the oxidation loss both in the furnace and due to "weathering".

One of the chief sources of scrap iron today resides in old discarded automobile bodies, particularly the fenders thereof, which are formed of sheet metal shaped so that they are extremely awkward to handle and are frequently associated with non-ferrous materials in a manner such that the separation of the iron from such materials under methods as they are now known and practiced, would make the cost of the scrap metal to the steel foundries prohibitive. The usual procedure in preparing the scrap metal of this character for the steel industry is to dump the old bodies into a fire of burning junk so as to burn off most of the organic material and then batter them into large awkward bales or bundles by means of a drop hammer. The bodies are ordinarily dismembered or cut into large sections more convenient for handling before being subjected to the action of the drop hammer. No attempt is made to remove the non-ferrous material such as the brass parts and fittings, nor is the dirt and non-combustible matter adhering to the fenders and other exposed surfaces removed before the metal is bundled. As a consequence the scrap material prepared in this way is contaminated to a very large degree by undesirable substances and although the steel content itself may be of the very highest quality, the material cannot command the high price nor will it produce the fine quality product that the steel content would otherwise warrant. My invention has therefore been devised primarily for the purpose of preparing this last mentioned type of scrap iron for melting purposes, but it is to be understood that while the process possesses certain advantages in connection with this type of scrap, that the invention is not in any way limited to this particular application.

The details in the method contemplated by this invention, together with other objects attending its production will be best understood from the following description of the accompanying drawing which diagrammatically illustrates one form of apparatus which may be employed in the practice of this process and in which,

Fig. 1 is a diagrammatic view showing the apparatus, and

Fig. 2 illustrates a bale or "billet" of material formed in the process of this invention.

In carrying out the process of my invention in connection with automobile bodies or other scrap

metal which is associated with organic material, it is preferable to first burn or heat the scrap in a relatively low temperature oxidizing fire to remove this organic material. Either before or after the "burning" operation, the scrap may be reduced in size by means of shears or other suitable cutting tools. This last mentioned step is dependent upon the size and power of the apparatus to be subsequently used and may, if an apparatus of sufficient size or shredding and beating means of suitable design are employed, be eliminated.

The scrap prepared in this way is then fed to a shredding machine preferably of extremely heavy and powerful construction such as is indicated diagrammatically by reference numeral 11 in Fig. 1. This shredding machine preferably consists of a heavy housing 12 having a cross shaft 13 supported in suitable bearings and associated with a powerful driving means such as an electric motor (not shown). The cross shaft 13 is provided with a multiplicity of heavy hammers or cutters 14 which are adapted to be rotated in the general direction of the arrow A so as to drive down upon and through the scrap metal which is fed through the hopper 15 over a heavy battering plate 16. The shredder is preferably provided with a screen indicated in dotted lines by reference numeral 17 so that the metal therein is beaten and shredded to a predetermined maximum size.

During this beating and shredding operation both the iron and the non-ferrous materials are thoroughly disintegrated and loosened and separated from one another so that the mass which is delivered from the shredder through the chute indicated at 19 consists of a mixture of iron and non-ferrous material.

This mixture or mass of material drops from the chute 19 onto a separator which is preferably of magnetic character and is illustrated as comprising a belt 21 which travels in the direction of the arrow B over a magnetic pulley 22 and a non-magnetic pulley 22′ and below a magnetic blanket indicated by reference numeral 24. This magnetic blanket 24 is preferably formed of a plurality of magnets which are alternately arranged with their north and south poles facing downwardly so that the iron or steel is held against the bottom run of the belt 27 and is turned over and over as the belt travels thereby further cleaning the iron of any dirt or oxide which may have adhered thereto after it has passed through the shredder 11.

The dirt and non-ferrous material which is carried with the iron falls onto a traveling belt 28 which is shown as traveling in the opposite direction from the lower run of the belt 27, this last mentioned belt being supported by pulleys 29 and 29′ operated in any suitable manner so as to convey the refuse material away from the iron which is to be recovered. This refuse material is shown as being dumped into a hopper 30 which is also shown as being associated with a screw conveyor 31 for conducting the same to a suitable dump pile.

When the scrap iron is released from the influence of the magnetic blanket 24 as is the case in the region of the pulley 22′ it is dumped into a suitable storage bin, or, as shown, is delivered into a hopper 34 on a baling press 35. Various types of baling presses may be used for the purpose of compressing the shredded scrap iron into units or blocks of convenient size for handling and in the drawing I have diagrammatically illustrated the press as comprising a cylinder member 36 associated with a ram or plunger 37 which in turn is actuated through a piston rod 38 from any suitable source of power such as a hydraulic ram (not shown). The compressing chamber of the baling press is shown as being provided with a door 40 and is associated with an ejector cylinder generally indicated by reference numeral 41. The material as it is being baled is subjected to a tremendous pressure and in view of the irregular shape of the individual particles, these particles are interlocked in the bale so that it is in the nature of a solid unit as indicated in Fig. 2 by reference numeral 42 and does not require tying or strapping. In other words, the bales or units as they are ejected from the baling press are ready to be loaded for shipment or delivered to the melting furnace for the manufacture of steel. Also, as has been indicated above, the metal of the bale has a minimum surface exposed to oxidation so that it is of a quality corresponding substantially to the so called "heavy scrap" (shafts, forgings, etc.) or billets.

It is to be understood that while I have herein described in detail one preferred form of apparatus for practicing the process of this invention, that the invention is not in any way limited to the specific form of apparatus shown but includes within its scope whatever changes fairly come within the spirit of the appended claims.

I claim as my invention:

1. The method of preparing ferrous melting scrap from a miscellaneous mixture of ferrous and non-ferrous scrap materials which includes: subjecting said miscellaneous scrap to a beating and shredding operation to disintegrate the iron and non-ferrous material therein; magnetically separating the iron from the non-ferrous material in said disintegrated mass; and compressing the loose shredded scrap iron so separated into a compact bale.

2. The method of preparing discarded automobile fenders and similar scrap materials for melting purposes which includes: subjecting said scrap to a beating and shredding operation to disintegrate the iron and non-ferrous material therein; separating the iron from the non-ferrous material in said disintegrated mass; and compressing the loose shredded scrap iron so separated into a compact bale.

3. The method of preparing scrap iron for melting purposes which includes: subjecting said scrap to a beating and shredding operation to disintegrate the iron and non-ferrous material therein; passing the disintegrated material beneath a magnetic blanket and above a traveling conveyor to separate the iron scrap from the non-ferrous material; and compressing the loose iron scrap so separated, into compact bales.

CLARENCE M. GREGG

Affidavit of Walter R. Derlacki

(342)

IN THE

UNITED STATES DISTRICT COURT

CENTRAL DIVISION OF CALIFORNIA

Case No. 65-1201-F

[SAME TITLE]

State of Ohio)
County of Cuyahoga) ss.:

Walter R. Derlacki, being duly sworn, deposes and says:

I am General Manager of Engineering for Luria Brothers & Company, Inc. (hereinafter called "Luria"), one of the defendants in this action, and I have supervised the building and operation of defendants' plant in Vernon, California, for producing a fragmentized ferrous scrap which defendants call Lurmet.

The commercial operation of defendants' Vernon plant began in September, 1963, and from that date until April, 1965, defendants produced Lurmet by a process which included (343) the steps of shredding raw ferrous scrap in a hammermill and then magnetically separating the ferrous pieces from the nonferrous material.

During the period of commercial production up to May, 1965 (as well as subsequent to that date), defendants experimented with modifications in the apparatus and process with the objective of minimizing costs and developing

knowledge in the production of shredded scrap. One cost problem in the operation of hammermills in shredding scrap is the wear of the shredding hammers, the grates and the breaker plates, as well as other parts.

One area of experimentation by defendants was with grates having openings of different sizes. These experiments confirmed our belief that the bulk density of Lurmet increased with grates having smaller openings and decreased with grates having larger openings. Defendants also found, as we had expected, that overall wear in the hammermill increased with the smaller grate openings and decreased with larger openings.

In April, 1965, defendants modified their commercial operation by installing in their hammermill grates having larger openings than the grates then currently in use (although grates previously used in defendants' process had such larger openings) and began separating out the larger pieces of ferrous scrap from the product and recycling them through the hammermill to produce Lurmet in the same density range as the product made prior to April, 1965.

I believe that the changes made during April, 1965, improved the efficiency of defendants' hammermill by minimizing over-grinding of the steel fragments, by increasing (344) the capacity of the hammermill and by decreasing the power requirements with the resulting reduction in wear, stress and other causes of down time.

Walter R. Derlacki

(Sworn to June 23, 1967.)

Affidavit of Menelaos D. Hassialis

(345)

IN THE

UNITED STATES DISTRICT COURT

CENTRAL DIVISION OF CALIFORNIA

[SAME TITLE]

State of New York)
County of New York) ss.:

MENELAOS D. HASSIALIS, being duly sworn, deposes and says:

I am an engineer and have been a member of the faculty of Columbia University for the past thirty years and chairman of the Krumb School of Mines of Columbia University for the past fifteen years. My fields of specialty are metallurgy, mineral engineering and mining, and through these fields of specialty I have acquired a knowledge of hammermills and their operation and of the technology used in the production of steel, including familiarity with ferrous scrap used in the manufacture of steel.

(346) I have been retained by the defendants, Luria Brothers & Company, Inc. and Lipsett Steel Products, Inc., to study plaintiff's and defendants' processes for fragmentizing scrap for use in the manufacture of steel and to conduct tests to establish facts which may be relevant to the issues in this lawsuit.

At the time that I inspected and conducted tests at defendants' plant at Vernon, California, the plant was then

producing ferrous scrap by a process in which automobiles and other ferrous scrap were fragmentized in a hammermill, the ferrous pieces were separated from the nonferrous material by a magnetic separator, and larger pieces of the ferrous material were separated from the fragmentized ferrous pieces and recycled through the same hammermill.

The separating of the larger pieces of material fragmentized in a hammermill and the recycling of the larger pieces through the same hammermill is a procedure long known and used in hammermill operations and is sometimes referred to as a "closed circuit" or a "circulating" hammermill operation. The fragmentizing of material in a hammermill in a "once through" operation without recycling is sometimes called an "open circuit" operation. It has been recognized for decades that hammermill wear can be reduced and efficiency and capacity increased in the production of a fragmentized product of a particular density by installing larger grate openings in the hammermill and changing the hammermill from an open to a closed circuit operation. Attached hereto as Exhibits E-1, E-2 and E-3 are copies of pages of the following textbook references describing closed (347) circuit or circulating operations of hammermills:

E-1. Taggart, *Elements of Ore Dressing* (1951) p. 381.

E-2. Richards, Locke and Schuhmann, *Textbook of Ore Dressing* (1940) p. 104.

E-3. Taggart, *Handbook of Mineral Dressing* (1927) pp. 4-84 to 4-86.

One of the tests which I conducted was to determine whether the larger separated pieces of ferrous material are further shredded and subdivided when they are recycled through the hammermill.

Affidavit of Menelaos D. Hassialis

My test procedure was as follows:

I selected sheets of galvanized steel having an average thickness of .048 inch because this material can be identified after fragmentization in the hammermill and the gauge is approximately that of the sheet steel used in the manufacture of automobile bodies. The sheets were crumpled somewhat to impart to them a shape more characteristic of the sheet metal of scrap automobile bodies, and the sheets were placed on the feed conveyor along with automobile bodies.

The automobile bodies and sheets of galvanized steel were processed in defendants' plant in the usual manner, that is, they were shredded in the hammermill, the ferrous fragments were separated from the nonferrous material, and the larger fragments of the ferrous material were separated from the ferrous pieces and collected on the recycling conveyor until the recycle conveyor was full. The material on the recycle conveyor (hereafter referred to as recycle sample A) was then removed from the recycle conveyor. The procedure was then repeated to produce another sample (hereafter referred to as recycle sample B) on the recycle conveyor.

(348) In separating out the larger fragments to be recycled some undersize material is carried along onto the recycle conveyor with the larger fragments. The pieces one inch and less of the recycle samples A and B were discarded because these pieces are well below the size that the plant was designed to recycle. The galvanized steel fragments more than one inch in size (hereinafter referred to as "plus one inch") of both recycle samples A and B were counted.

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Recycle sample B was then fed into the hammermill simultaneously with automobile bodies, and the discharge was then collected and screened on a one inch screen . The pieces of plus one inch galvanized steel were collected and counted. The remaining material was then screened on a ½ inch screen and the plus ½ inch galvanized pieces were collected and counted. The ratios of galvanized pieces after and before recycling were 3.3:1 for all plus one inch pieces and 5.1:1 for all plus ½ inch pieces. The less than ½ inch pieces were numerous, and the ratio would be greatly increased if they had been counted.

The recycle sample A was then fed into the hammermill without other feed to simulate the operating condition in which the continuously operating recycle conveyor feeds recycle material to the hammermill during a gap in the introduction of automobile bodies to the hammermill. The product was collected, screened through a one inch screen, the plus one inch galvanized pieces were separated and counted, the remaining material was screened through a ½ inch screen, and the plus ½ inch pieces of galvanized material were separated and counted. The ratios of galvanized pieces of recycle sample A after and before recycling were 3.6:1 for (349) all plus one inch pieces and more than 5.3:1 for all plus ½ inch pieces. The less than ½ inch pieces were numerous, and the ratio would be greatly increased if they had been counted.

These tests show that the recycled ferrous pieces are shredded and subdivided well over fivefold in defendants' hammermill.

Menelaos D. Hassialis

(Sworn to June 13, 1967.)

Exhibit E-1 Annexed to Affidavit of Menelaos D. Hassialis

Taggart, *Elements of Ore Dressing* (1951) p. 381

(See Opposite ☞)

ELEMENTS OF

ORE DRESSING

By

ARTHUR F. TAGGART

Professor of Mineral Engineering
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NEW YORK · JOHN WILEY & SONS, INC.
LONDON · CHAPMAN & HALL, LTD.

size. Both of these results are unsatisfactory in ordinary milling practice. If, however, a size separator is introduced into the circuit and the flow is arranged so that nothing can escape except as undersize of this separator, oversize being returned continuously to the size reducer, particle-size distribution in the product is changed so that average product size is much coarser, and the capacity of the size reducer is increased markedly. Such an arrangement is called a closed circuit.

There are two basic forms of closed circuits, as shown in Fig. 10. The characterizing difference lies in the order of size reducer and size

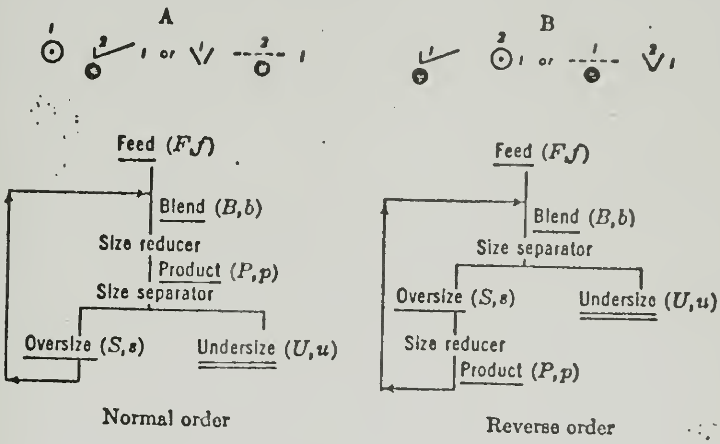

FIG. 10. Basic forms of closed circuits.

separator in the flow. The order reducer-separator (item A), which may be called the normal order, predominates in grinding circuits, whereas the reverse order (item B), with new feed to a scalping screen, predominates 5:1 in secondary crushing. Primary-crushing circuits are invariably open.

Inspection of Fig. 10 shows that the tonnage U of undersize must, on average, equal the tonnage F of new feed. Marked departures from this condition exist only during bring-up and shut-down and when feed rate or operation of the sizing device is changed. Otherwise fluctuations from equality are small. Hence the operating, balanced circuit is characterized by the condition

$$F = U \tag{11}$$

It follows from Eq. 11 that the composite stream tonnage B in each

15a

Exhibit E-2 Annexed to Affidavit of Menelaos D. Hassialis

Richards, Locke and Schuhmann, *Textbook of Ore Dressing* (1940) p. 104

(See Opposite ☞)

TEXTBOOK

OF

ORE DRESSING

BY

ROBERT H. RICHARDS, S.B., LL.D.

Professor Emeritus of Mining Engineering and Metallurgy at the Massachusetts Institute of Technology; Author of "Ore Dressing"

AND

CHARLES E. LOCKE, S.B.

Professor of Mining Engineering and Ore Dressing, in Charge of Department of Mining Engineering, at the Massachusetts Institute of Technology

ASSISTED BY

REINHARDT SCHUHMANN, Jr., Sc.D.

Assistant Professor of Mineral Dressing at the Massachusetts Institute of Technology

Third Edition
Completely Revised and Rewritten
Fourth Impression

McGRAW-HILL BOOK COMPANY, Inc.
NEW YORK AND LONDON
1940

CHAPTER IX

SIZING BY SCREENS

Screen sizing or volumetric sizing is useful in performing a variety of functions in ore concentration plants. (1) In crushing plants, screens are used for two general purposes: (*a*) to by-pass sufficiently fine material around a crushing machine to increase its capacity and (*b*) to form a closed circuit with a crushing machine and limit the maximum size of final product as well as to increase crushing capacity and efficiency. (2) In certain processes of concentration, particularly in gravity concentration above 1 or 2 millimeters, the crushed ore may be divided into a series of products by screening, in each of which the grains come within a limited range of size. Such a grading of the crushed ore into fractions for feed to the individual concentration machines enables each machine to be adjusted and operated for better separations than would be the case with unsized feed to these machines divided evenly by a mechanical distributor. (3) In laboratory testing of ores and mill products, segregation of the material into different size fractions for separate testing facilitates analyses of results, losses, and inefficiencies, in both comminution and concentration, to such an extent that sizing tests are an indispensable part of both routine control and research. (4) In certain industries, when product size forms a part of final product specifications, screens are used for commercial grading to segregate products for meeting these specifications.

Principles of Screen Sizing

Sieve Scale.—The list of successive screen sizes used in any mill, taken in order from coarsest to finest, is called the "sieve scale." For facility of interchange of results and data in publications, catalogues, and elsewhere, it has been found most convenient to adopt a *standard sieve scale* for sizing analyses and general testing work. Rittinger held that in a standard sieve scale the diameter of the holes in any screen must bear some constant ratio to that of the next screen above it in the series, thereby making the sieve scale a geometrical series. He adopted 1.414 ($= \sqrt{2}$) for this ratio, and it has since become the common sieve ratio. For closer sizing work the Richards or double Rittinger sieve ratio of 1.189 ($= \sqrt[4]{2}$) is common. The Tyler testing sieves, now the universal standard in most countries, are available including both these ratios, but the series with the ratio of 1.414 is usually used. The starting point is a 200-mesh screen as standardized by the United States Bureau of Standards with 0.0021-inch wire and 0.0029-inch opening. The Tyler series is shown in Table 23, with other pertinent data. The column giving screen openings in microns should be noted, as there is a tendency to express finer sizes in this unit in sizing fine materials such as fine-grinding and flotation products. This usage is a result of the extension of size analysis below 200 mesh by elutriation, in which the fine sizes are much more conveniently expressed in terms of microns than in other units. The physicists and chemists, particularly the colloid chemists, have established this unit in their related considerations of particle size in very finely divided material (see also Sizing in Chapter XVIII).

Exhibit E-3 Annexed to Affidavit of Menelaos D. Hassialis

Taggart, *Handbook of Mineral Dressing* (1927) pp. 4-84 to 4-86

(See Opposite ☞)

HANDBOOK
OF
MINERAL DRESSING

ORES AND INDUSTRIAL MINERALS

4/28/54

BY

ARTHUR F. TAGGART

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NEW YORK
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A 38×30-in. machine running at 1,150 r.p.m.; power consumption 3.28 hp-hr. per ton; maintenance, 28¢ per ton. The machine has a variable-speed motor; when speed is dropped to 850 r.p.m. and closing screen is changed to 1/4 in., production rises to 13 t.p.h., power consumption is 1.80 hp-hr. per ton, and maintenance is 10¢ per ton. Aluminum oxide is crushed from <4-in. to <4-m. at the rate of 2.5 t.p.h. in a 32×11-in. machine in closed circuit with a screen; speed is 1,200 r.p.m., power consumption 5 hp-hr. per ton, and maintenance 40¢ per ton.

Table 28. Performance of hammer mills on cement rock [a]

Rotor, diam. × length, in.	42×36	48×38	48×38
Speed, r.p.m.	900	720	720
Feed: Limiting size, in.	5	8	8
Tons per hr.	100	300	500
Power: Motor hp.	250	400	400
Consumed, idling, hp.	22	38	38
Hp-hr. per ton crushed	1.8	0.8	0.5
Product: % retained on			
1 1/2-in.	....	....	5.0
1	....	....	13.9
3/4	0.3	5.3	19.1
3/8	13.1	21.5	39.2
4-m.	25.4	22.4	....
8	20.6	20.5	13.6
14	14.8	12.8	2.2
28	6.1	6.5	1.7
48	5.5	3.8	0.9
100	3.6	3.0	0.4
<100	10.6	4.2	4.0
Maintenance, cents per ton	1 1/2	3/4	3/8

[a] Laminated, medium hardness (10,000 to 16,000 lb. per sq. in. in compression), relatively nonabrasive.

Operating variables are number and shape of hammers, with consequent differences in diameter and configuration of hammer circle; speed; number, size, arrangement, and spacing of anvil or breaker plates; height of feed chute; spacing of grate bars, both as to aperture and approach to the hammer circle; and feed rate and feed size.

Size of product depends on character of rock, size of feed, type of mill, whether or not a grid is used; whether the mill is in open or closed circuit; if the former, on the grid spacing; if the latter, additionally on the aperture of the closing screen; the shape, spacing and extent of wear of the breaking surfaces; rotor speed; clearance of hammer circle with respect to the lowest breaker plate and to the grids; hammer weight; etc. Some of these relationships for an impactor (machine without grid) are given in Figs. 64 to 69. These curves represent results (*PC*) of extensive tests on an operating machine working on tough river gravel, and, while not applicable directly as to magnitudes for softer materials, are dependable as to trends.

Fig. 64 shows that if the crushing zone is completely swept by hammers, as it was with three rows of stirrup hammers, two to a row, an increase of 50% in NUMBER OF HAMMERS produces but little additional

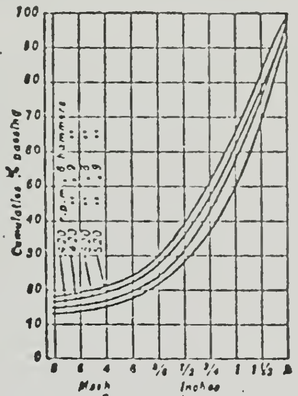


FIG. 64. Effect of number of hammers on product (of an Impactor (feed, river gravel, 4 1/2~1 1/4-in.).

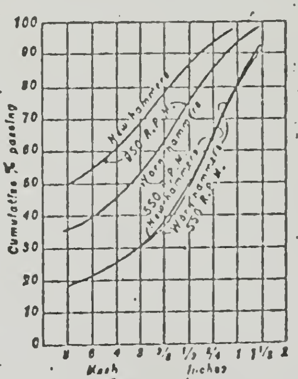


FIG. 65. Effect of hammer wear on Impactor product (feed, river gravel, 4 1/2~1 1/4-in.).

crushing effect, and that this effect is less the higher the speed. Fig. 65 shows the loss in crushing effect due to WORN HAMMERS when speed is high enough for effective breaking (950 r.p.m.); it also shows that when speed is too low (550 r.p.m.) the state of the hammers makes little difference; in this event, in a grid machine, stalling would occur rapidly unless feed rate were greatly reduced below that at 950 r.p.m.

with new hammers. Fig. 56 indicates that within the usual range of ANVIL ADJUSTMENT the variation in crushing due to change in clearance is not great, but is definite, and that crushing increases with reduction in clearance. The effect is greatest in the coarse end of the product, as is to be expected. Fig. 57 shows that with a cage-type mill, crushing a moderately hard bituminous coal, decrease in clearance

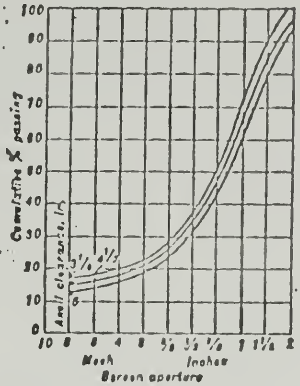


Fig. 56. Effect of anvil clearance on Impactor product (river gravel, 4 1/2~1 1/4-in.; 420 r.p.m.).

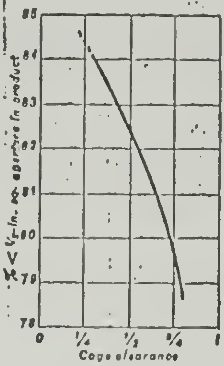


Fig. 57. Effect of cage clearance on size of bituminous-coal product.

has considerable effect on size of product. Fig. 58 shows the primary importance of high SPEED, particularly in the production of fines; the increase in fines is more than proportional to the increase in speed over the range investigated. Average speed is about 200 f.p.s. at the tip of new hammers, being, in general, somewhat lower for coarse feeds and coarse products and vice versa. This follows from the effect of particle size on striking force. Fig. 59 indicates that FEED SIZE has little effect on the amount of <100-m. in the product but that the limiting reduction ratio increases with increase in size of feed from about 2 for the finer feeds tested to 3 for the coarsest. The ratio of 50%-sizes (50% retained) is apparently largely dependent upon the smallest particles in the feed; for the conditions tested it was 5.5 for

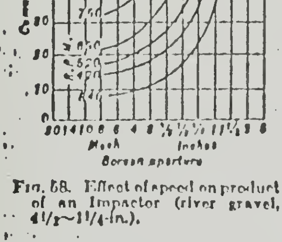
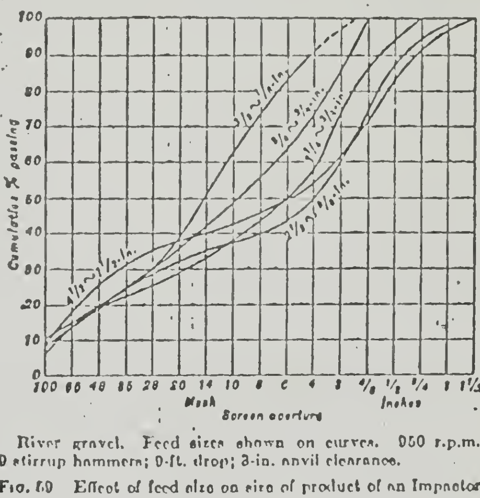


Fig. 58. Effect of speed on product of an Impactor (river gravel, 4 1/2~1 1/4-in.).



River gravel. Feed sizes shown on curves. 950 r.p.m.; 9 stirrup hammers; 9-ft. drop; 3-in. anvil clearance.

Fig. 59 Effect of feed size on size of product of an Impactor.

1/8 in. lower size, from 6 to 8 for 3/8-in. lower size, and jumped to 10 for 1 1/2-in. lower size. In so far as the 50%-point measures the average size of a comminuted product, the conclusion would seem to be that this type of mill is decidedly more effective in reduction of the coarser (1 1/2-in. min.) than the finer (1/8- and 3/8-in. min.) feeds.

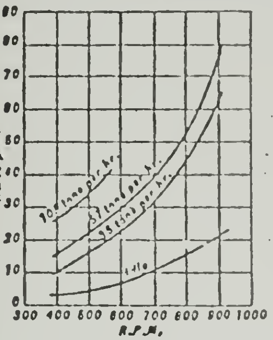
Mineralogical character of feed affects performance somewhat unexpectedly. In general hard tough rock crushes at a lower rate and requires more power than the complete converse, but reduction in

capacity with increase in power consumption with a given cage aperture and setting are reported in changing from Elkhorn to Pocahontas coals, and some clays are more difficult to crush than hard, compact limestones. The limiting machine factor is, in many such cases, the cage aperture and placing; it is probable that most of the discrepancies in reported results would disappear with suitable experimentation on this score.

Shape of product is of great importance in producing stone and sand for concrete work (see Sec. 3, Art. 41). Shape characteristics of products for different intermediate crushers have not yet been established generally.

At Norris Dam, crushing cherty limestone, $<^1/_4$-in. hammer-mill product was most nearly equalized, followed in order by rod mills, short-head cones, and rolls. The effect was more pronounced on the carbonate than on graywacke (*42 80 RP 40*). An entirely different order of machines might be found with a different rock.

Power consumption in a hammer mill is dependent upon the amount of crushing work that the mill does, which, in turn, is determined primarily by the character of feed, the size of product, the speed, and the feed rate. Fig. 60 shows the relationship between feed rate, speed, and power consumption for one set of conditions; the trend is characteristic of all.



Feed, $4^1/_2 \sim 1^1/_2$-in.; products, see Fig. 67; 9 hammers; single-anvil cage.

FIG. 60. Power consumption vs. speed in crushing river gravel at different rates in an Impactor.

The following data on crushing two bituminous coals at Toledo Furnace (*PC*) in the same mill show that the effect of hardness of feed is not always what would be expected: Elkhorn coal (very hard bituminous), 108 t.p.h., 1.60 hp-hr. per ton, product 60% $<^1/_8$-in.; Pocahontas coal (very soft) 140 t.p.h., 3.3 hp-hr. per ton, 82% $<^1/_8$-in.; moisture was 3.9% in both cases. The probable explanation of reduced capacity with the softer coal is screen clogging, probably owing to the immediate shattering and rush to the screen; the rise in power consumption under such circumstances is caused by the resistance of material on the cage; that such a condition exists is indicated by the relative fineness of product; the remedy would be to use larger cage apertures for the softer material. Effect of CAGE SPACING (distance from inner surface of cage to hammer circle) on power consumption is shown by the following runs on Elkhorn and Pocahontas coals at Toledo Furnace: Elkhorn: close, 200 hp.; medium, 210 hp.; far, 220 hp.; Pocahontas: close, 220 hp.; medium, 201 hp.; far, 170 hp. Cage aperture was $1^1/_2$-in. in all cases; feeds were all rather wet. Usual motor allowance for mills crushing Pennsylvania bituminous coals to 70% $<^1/_8$-in. is 2 hp-hr. per ton; consumption ranges from 0.5 to 2.0 according largely to the extent of crushing, the moisture in the feed, and the sharpness of the steel.

Motors. A well-built hammer mill in secondary or fine service, with feed finer than 3-in., may be powered with a motor of not more than 15% overload capacity; if the feed size runs up to 4- or 5-in., peak loads will run 25 to 33% above normal full-load power draft; in coarse-crushing the power draft may fluctuate as much as in a jaw crusher (Art. 2). Recommended motor sizes are given in Tables 20 and 27.

Moisture in feed decreases capacity and increases power consumption markedly through the critical range in which fines are rendered sticky. With bituminous coal, capacity reduction is 30 to 50% and power increase about the same. The critical moisture range for most materials is about 0 to 10%. The cause is, of course, clogging of the grid. The remedy, if drying or further wetting is impractical, is to increase cage aperture or, if limiting size is important, to use a gridless machine and do the necessary screening on separate screens, better fitted for difficult separations, and where clogging will not cause excessive power consumption.

Feed rate should be regular; otherwise grid mills tend to clog on the rushes. In some grid mills in secondary service, especially with new steel and exceptionally coarse feed, the motors cannot be kept up to full-load power on account of incipient clog-up and consequent peak loads that tend to follow slugs of segregated coarse feed material.

Circulating loads vary materially with size of feed, feed rate, number of rows of hammers, extent of wear of hammers and breaking plates, moisture content, and resulting effect on screen efficiency. The fines returned from an inefficient screen tend to cut down crusher capacity, thus aggravating the circulating-load build up. Circulating load at Norris Dam with $1^1/_2$- and 2-in. grid spacing and $^1/_4$-in. closing screen ranged from 60 to 100% of new feed; the circulating load all passed a 1-in. square hole.

Free fall of feed from feed chute to crushing zone determines penetration of hammer circle by the feed particles, and thereby affects both capacity and wear. If free fall is too

District Court's Findings of Fact and Conclusions of Law

(610)

IN THE

UNITED STATES DISTRICT COURT

CENTRAL DISTRICT OF CALIFORNIA

[SAME TITLE]

FINDINGS OF FACT

1. *Action, Parties, Jurisdiction*

1.1 This is an action for infringement of claim 9 of Proler reissue patent Re. 25,034 (hereinafter "Proler reissue patent").

1.2 Plaintiff, Proler Steel Corporation, a Delaware corporation, the owner of the Proler reissue patent, has its principal place of business in Houston, Harris County, Texas, and is licensed to do business in the State of California.

(611) 1.3 Defendants, Luria Brothers & Company, Inc., a Delaware corporation, and its wholly owned subsidiary, Lipsett Steel Product, Inc., a New York corporation, have since September, 1963, produced a fragmentized ferrous scrap called Lurmet at their plant in Vernon, California.

1.4 The jurisdiction of this court is predicated upon 35 U.S.C. §281, §1338(a) and §1400(b).

Findings of Fact

2. *Proler Reissue Patent*

2.1 The Proler reissue patent is a reissue of U. S. patent No. 2,943,930 issued July 5, 1960, now surrendered (hereinafter "original Proler patent"). U. S. patent No. 2,943,930, in turn, was a continuation of an abandoned application Serial No. 677,514, filed August 12, 1957 (hereinafter "abandoned Proler application").

2.2 The original Proler patent and the Proler reissue patent describe a process for the upgrading of raw ferrous scrap which includes the steps of (1) shredding or fragmentizing the raw ferrous scrap in a hammermill, (2) separating the more ferrous bearing material using a magnetic separator, (3) roasting the ferrous fragments in a kiln to remove adhered nonferrous material, and (4) passing the fragmentized ferrous scrap between rolls for the purpose of compacting and balling it up to increase the bulk density of the product while maintaining the individuality of the separate pieces.

2.3 During the prosecution of the original Proler patent and the abandoned Proler application the plaintiff through its attorneys made the following statements in (612) support of its position that the roasting step was an important and novel step of the Proler process and one which distinguished it over prior art patents cited by the Patent Office:

> "The process claims have been revised and consolidated into two new claims which are believed to better emphasize the novel features of the process. These novel features include the following:
>
> * * *
>
> (2) The reduction of the raw material to a fluent state and the concentration thereof *followed by the*

> *purification thereof in a kiln.*'' (Exhibit F, attached to defendant's memorandum, page 22; emphasis added)

* * *

''Applicant will agree that the kiln treatment is an important step in the invention, but not just kiln treatment alone, and not kiln treatment of just any material. Somes is not concerned with junk yard scrap and does not produce any upgraded scrap at all since the borings are fed directly into a steel furnace. Somes kiln heats has (sic) borings to 'volatilize' the water and oil or, with the addition of coke, to reduce oxides. His kiln is operated at 600 to 800 degrees Fahrenheit (page 2, column 2, lines 69-70). Applicant on the other hand operates at a much higher temperature not only to oxidize the combustible (613) materials but to melt off the non-ferrous metals and crack off the refractory materials.''

* * *

''Applicant will admit that size reduction and magnetic separation are old steps, e.g. as shown in the cited supplemental German reference, or in the Gregg patent (supra), but there is no suggestion of the combination of such steps with the steps of roasting the resultant material and then rolling the roasted scrap.'' (Exhibit F, page 23)

* * *

''* * * None of the references shows a kiln roasting step both operating at the temperature specified by applicant and used for applicant's purpose.'' (Exhibit F, page 25)

* * *

Findings of Fact

"* * * Gregg does not even suggest a temperature of 1300° F to 1800° F for roasting scrap. He desired only to remove organic materials, which would be burned off at much lower temperatures. He does not suggest the use of higher temperatures. These higher temperatures are to a large extent responsible for the tremendous commercial success of applicant's process, since it is only by the use of such temperatures that low melting point alloys and ceramic materials which are adhered to the ferrous materials can be removed. Furthermore hardened steels are drawn by these high temperatures, so that they are more easily (614) compacted.

* * *

"Somes adds nothing to the teaching of Gregg. The only portion of his disclosure which is pertinent is his heating of borings to drive off water and cutting oils. This is done at 600 to 800° F. There is no suggestion of using any temperature anywhere near as high as that of applicant's process, and indeed such high temperatures are neither necessary or desirable in Somes' process. Somes' metal borings contain no low melting alloys, nor any ceramic materials, nor any other material which requires a temperature of 1300 to 1800° F to purify his material. The Examiner states that the desired temperature range is easily derivable by routine experiment, but this position is untenable without some showing of the desirability of the high temperatures. The disclosure of Somes does not suggest that any experimentation is desirable to derive the proper temperature range; in fact, he specifies a temperature range for his process, thereby eliminating the necessity of experimentation. Gregg, on the other hand, does not specify a temperature range, but sets forth standards by which one may derive the desired

> temperature range by routine experiment. This standard, however, is a *relatively low temperature to remove organic material.* This obviously leads directly away from applicant's teaching of a (615) high temperature to melt off low-melting metals and to crack off ceramic materials. Therefore there is no basic (sic) in either of the references for deriving applicant's temperature range by routine experiment." (Exhibit F, pp. 34-35)
>
> * * *
>
> "* * * The conducting of the roasting step after the milling *is of major importance in applicant's process,* since materials which are removed by the roasting are more readily contacted by the high temperatures. Chamberlain does his heating after the scrap has been compressed into a bale. Obviously such heating cannot effectively burn off combustibles, or cause ceramics to crack off. (Exhibit G, attached to defendants' memorandum, page 19; emphasis added)

2.4 All of the claims of the original Proler patent were limited to a process or a product made by a process which included the roasting step.

2.5 Five months after the original Proler patent issued the patentee Proler filed an application to reissue the patent and broaden it by the addition of claims 9 and 10 which are not limited to a process which includes the roasting step.

2.6 In the application for the reissue patent the patentee Proler stated in the oath that the original Proler patent was "partly inoperative by reason of a defective specification, in that the claims in the said patent do not include claims broad enough to provide full protection to

the inventor''. Proler further stated that the failure to (616) broadly claim the invention in the original Proler patent ''arose through error and without any deceptive intention on the part of Deponent''. (Pp. 9 and 10 of Exhibit H attached to defendants' memorandum)

2.7 There is nothing in the file of the Proler reissue patent which states the facts constituting the ''error'' relied on as the basis for the reissue patent.

3. *Claim 9 of the Proler Reissue Patent Recites Nothing More Than the Known Functions of Apparatus Old in the Art*

3.1 Plaintiff has admitted that the process of the Proler reissue patent could be practiced using a hammermill, magnetic separator and rolls which were conventional at the time of the alleged invention by the patentee (plaintiff's response to defendants' interrogatories 10B, C and E; also Pretrial Conference Order 111(k)).

3.2 The Proler reissue patent shows schematically a conventional hammermill 11, a conventional magnetic separator 16, and conventional rolls 19, and fails to describe any novel design or structure for these pieces of equipment.

3.3 The steps in claim 9 of the Proler reissue patent of shredding automobile scrap in a hammermill and then magnetically separating the ferrous fragments from the nonferrous material are steps which have been practiced by a scrap processor, Los Angeles By-Products Company of Los Angeles, California, during the 1930s and 1940s (plaintiff's response to defendants' interrogatory 13F).

3.4 The Gregg patent No. 2,059,229 (a copy of which is attached to defendants' memorandum as Exhibit B)

for "Method of Preparing Discarded Automobile Fenders and (617) Similar Material for Melting Purposes," issued November 3, 1936, describes a method for preparing "a clean high-grade scrap iron" (p. 1, column 1, lines 35-36) from, *inter alia,* "old discarded automobile bodies" (page 1, column 2, line 6) by the steps of (a) shredding or fragmentizing automobile scrap in a hammermill, (b) magnetically separating the ferrous fragments from the nonferrous material, and (c) either discharging the ferrous fragments "into a suitable storage bin" (page 2, column 2, lines 1 and 2) or delivering it to a hopper of a baling press in which it is compacted into bales.

3.5 Sam Proler, the patentee and president of plaintiff, has admitted that he was familiar with rolls and their function prior to making his invention, and in his deposition testimony described the commercial use of rolls by plaintiff prior to 1956 for compacting tin cans (Proler deposition, pages 173-175; also plaintiff's response to defendants' interrogatory 13F).

3.6 Patentee Proler has testified that the compacting and balling up function of the rolls 19, as recited in the third step of claim 9 of the Proler reissue patent, is the ordinary flattening and compressing function of conventional rolls:

> "Q. So flattening, in your mind, is the same as balling up; is that right? A. If it increases the density by decreasing the size of the piece.
>
> Balling up may not be making it perfectly flat, but making it smaller in size, the piece itself, than it was before you did anything (618) to it." (Proler deposition, page 171.)

3.7 In the process of claim 9 of the Proler reissue patent a conventional hammermill is used to perform its known function of shredding ferrous scrap, a magnetic separator is used for its known function of separating the ferrous fragments from the nonferrous material, and the rolls are used to perform their known function of compacting the ferrous fragments. All three pieces of equipment have been used commercially by scrap processors, including plaintiff, to perform these functions long prior to April 1957, the date of invention alleged by plaintiff.

4. *Defendants' Accused Process Does Not Infringe Claim 9 of the Proler Reissue Patent*

4.1 The commercial operation of defendants' Vernon plant began in September 1963, and from that date until April 1965 defendants produced a fragmentized scrap which defendants call Lurmet by a process which included the steps of shredding raw ferrous scrap in a hammermill and then magnetically separating the ferrous pieces from the nonferrous material.

4.2 Plaintiff has conceded that the steps of shredding ferrous scrap in a hammermill and then magnetically separating the ferrous pieces from the nonferrous material are old and do not infringe the Proler reissue patent (quotation from Exhibit 4, page 23, in finding 2.3 above; plaintiff's response to defendants' interrogatories 6C and 14D).

4.3 In April 1965 defendants modified their commercial operation by installing in their hammermill grates having larger openings than the grates then currently in use (619) (although grates previously used in defendants' process had such larger openings) and began separating out the larger pieces of ferrous scrap from the product and

recycling them through the hammermill to produce Lurmet in the same density range as the product made prior to April 1965.

4.4 It is the operation of defendants' plant subsequent to April 1965 that plaintiff charges infringes claim 9 of the Proler reissue patent. More specifically, plaintiff charges that the function of the hammermill on the recycled scrap is the same or the equivalent of the function of the compacting rolls in plaintiff's patented process described in the third step of claim 9 as "individually compacting and balling up the pieces of the more ferrous bearing shredded material to densify it while maintaining the individuality of the separate pieces."

4.5 The separation of larger pieces of material fragmentized in a hammermill and recycling those larger pieces in a hammermill is a standard and recognized procedure for operating a hammermill and has been described in textbooks long prior to the date of the alleged invention of the Proler reissue patent (Hassialis affidavit attached to defendants' memorandum as Exhibit E).

4.6 The Proler reissue patent discloses only the use of rolls to carry out the compacting step of claim 9 "while maintaining the individuality of the separate pieces."

4.7 The function of defendants' hammermill is to shred and subdivide the pieces of ferrous scrap to increase their density, thereby destroying the individuality of the pieces (Hassialis affidavit, Exhibit E), in contrast to the function of the rolls in the Proler reissue patent which (620) compact the pieces of ferrous material to increase its density "while maintaining the individuality of the separate pieces."

4.8 The patentee Proler does not dispute that the recycling of fragmentized scrap to the hammermill results in further shredding of the pieces and testified as follows:

> "Q. I thought you had originally testified that some of the material originally put in and shredded continued around several cycles, around the rotor before it came out? A. That is what I say, it shreds and comes out in small pieces.
>
> "Q. Even though a smaller piece? A. Even though a smaller piece, it is shredded, comes out in small various-sized pieces, smaller than the opening of the grate.
>
> "Q. Why isn't the recycled material shredded too as it goes back in for recycling? A. It is, and that is the reason we are here.
>
> "Q. Right, but I don't see how you distinguish between the two. A. Well, they recycle the material that is larger and heavier, although it came through the grate openings, to recycle back through the mill to reduce the size and increase the weight."

(Proler deposition page 203, line 13, through page 204, line 7; see also Hassialis affidavit.) Proler also testified that the same shredding occurs when the ferrous scrap is first fed into the hammermill:

> "The first time you put it through, you put in a whole car or a stove or a refrigerator, and (621) it shreds it up into small pieces." (Proler deposition, page 25, line 24, page 26, line 2.)
>
> * * *
>
> "Actually, it shreds the material up. There are big pieces such as automobiles, stoves, refrigerators, ice boxes, and the hammers rip through and tear and shred the big pieces up and throw them around, and

if they are small enough to go through the grate, they go through the grate opening size, and if they are bigger, they go around, and it shreds them and it tears them up again, and they come out shredded and in smaller pieces and fall through the openings.'' (Proler deposition, page 43, lines 5-13.)

CONCLUSIONS OF LAW

1. Claim 9 of the Proler reissue patent is invalid as an aggregation of old steps which are nothing more than the known functions of old elements. These old elements when brought together fail to produce any result which would be unexpected, unusual or surprising to a person of ordinary skill in the art of processing scrap, or any additional or different function when brought together than they normally perform separately—the hammermill shreds, the magnetic separator separates the ferrous pieces from the nonferrous material and the rolls compact the ferrous pieces.

2. Shredding recycled ferrous scrap in defendants' hammermill is not the same as or the equivalent of the step of compacting shredded scrap between rolls, described in the third step of claim 9 of the Proler reissue patent as ''individually (622) compacting and balling up the pieces of the more ferrous bearing shredded material to densify it while maintaining the individuality of the separate pieces.''

3. The functional language of claim 9 of the Proler reissue patent, properly construed pursuant to 35 U.S.C. §112, is not infringed by defendants' operation of shredding ferrous scrap in a hammermill, separating the ferrous pieces from the nonferrous material and feeding the larger

ferrous pieces along with raw scrap through the hammermill for further shredding and subdivision.

4. Claim 9 of the Proler reissue patent is invalid on the ground that it fails to satisfy the requirements of 35 U.S.C. §251 in that it covers an invention different from the one disclosed in the original Proler patent.

5. Claim 9 of the Proler reissue patent is invalid on the ground that it fails to satisfy the requirements of 35 U.S.C. §251 in that the defect of the original Proler patent did not arise through error.

6. Claim 9 of the Proler reissue patent is invalid on the ground that the applicant for the Proler reissue patent did not make the requisite showing of the circumstances to support a conclusion "that the failure to include claims broad enough" in the original Proler patent "arose through error."

7. The Commissioner of Patents was without authority to reissue the original Proler patent by reason of the defective oath filed in support thereof which failed to show any error or how the error arose as is required by 35 U.S.C.
§251 and Rule 175(4) of the Rules of the United (623)
States Patent Office in Patent Cases.

Dated this 27th day of September, 1967.

Warren J. Ferguson
United States District Court Judge

Judgment on Motion for Summary Judgment

(625)

IN THE

UNITED STATES DISTRICT COURT

Central District of California

[Same Title]

This cause having come on for hearing on the motion of defendants, Luria Brothers and Company, Inc., and Lipsett Steel Products, Inc., for summary judgment, pursuant to Rule 56 of the Federal Rules of Civil Procedure; the Court having considered the pleadings, affidavits and exhibits filed herein, and having heard the argument of counsel; and the Court finding there is no genuine issue of fact to be submitted to trial, and finding that defendants are entitled to judgment as a matter of law;

It Is Ordered, that defendants' motion for summary judgment be and the same is hereby granted; and therefore

It Is Ordered, Adjudged and Decreed that claim 9 of plaintiff's reissue patent, Re. 25,034, is invalid and (626)
not infringed; and

It Is Further Ordered, Adjudged and Decreed that the action be dismissed and that defendants recover from plaintiff their costs.

Dated this 27th day of September, 1967.

Warren J. Ferguson
United States District Judge

Decision of Ferguson, J., on Appellant's Motion for Reconsideration of Grant of Motion for Summary Judgment

* * *

(143) The Court: Well, the reason that I gave a lot of time to this case in the motion for reconsideration—you may be seated, Mr. McConn—I am just completing—I am just starting my second year here on the Federal bench. And there is a tendency when you are young and just coming on to be hasty. And I wanted to make certain—at least in my own mind—that my ruling in granting the summary judgment was not ill-advised.

There hasn't been anything presented to me which requires me to feel that I was ill-advised, or that I should reconsider my present ruling.

I think the case basically is summed up, Mr. McConn, by Mr. Graves and your reference to your getting up to the podium yesterday and showing this picture of this fellow holding this piece of scrap in his hand and stating that, I could talk about this to a jury for at least 30 minutes.

There is no question about it that there are a lot of things in this case that you could take a lot of (144) time in talking about to a jury. But I think the end result is that it is probably more talk than substance.

And I am more convinced that my present rulings are correct. But at least I have done all I can when you were in chambers to make sure that your and your client's rights are fully protected on appeal. And I don't want to do anything which jeopardizes your substantive and procedural rights. I just merely happened to disagree with your position concerning the patent. But I certainly agree with your position as an advocate that you have the right to pursue to the limit.

Therefore the motion for reconsideration will be denied.

* * *

Statutes

35 U.S.C. §103

§103. Conditions for patentability; non-obvious subject matter

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

35 U.S.C. §112

§112. Specification

* * *

An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

35 U.S.C. §251

§251. Reissue of defective patents

Whenever any patent is, through error without any deceptive intention, deemed wholly or partly inoperative or invalid, by reason of a defective specification or drawing, or by reason of the patentee claiming more or less than he

had a right to claim in the patent, the Commissioner shall, on the surrender of such patent and the payment of the fee required by law, reissue the patent for the invention disclosed in the original patent, and in accordance with a new and amended application, for the unexpired part of the term of the original patent. No new matter shall be introduced into the application for reissue.

* * *

Rules

Rule 175(a)(4) of Rules of Practice in Patent Cases

175. *Reissue oath or declaration.* (a) Applicants for reissue, in addition to complying with the requirements of the first sentence of rule 65, must also file with their applications a statement under oath or declaration as follows:

*   *   *

(4) Particularly specifying the errors relied upon, and how they arose or occurred.

Fed. R. Civ. P. 56(c)

(c) *Motions and Proceedings Thereon.* The motion shall be served at least 10 days before the time fixed for the hearing. The adverse party prior to the day of hearing may serve opposing affidavits. The judgment sought shall be rendered forthwith if the pleadings, depositions, answers to interrogatories, and admissions on file, together with the affidavits, if any, show that there is no genuine issue as to any material fact and that the moving party is entitled to a judgment as a matter of law. A summary judgment, interlocutory in character, may be rendered on the issue of liability alone although there is a genuine issue as to the amount of damages.

*   *   *

Fed. R. Civ. P. 56(e)

Rule 56

*   *   *

(e) *Form of Affidavits; Further Testimony; Defense Required.* Supporting and opposing affidavits shall be made on personal knowledge, shall set forth such facts as would be admissible in evidence, and shall show affirma-

tively that the affiant is competent to testify to the matters stated therein. Sworn or certified copies of all papers or parts thereof referred to in an affidavit shall be attached thereto or served therewith. The court may permit affidavits to be supplemented or opposed by depositions, answers to interrogatories, or further affidavits. When a motion for summary judgment is made and supported as provided in this rule, an adverse party may not rest upon the mere allegations or denials of his pleading, but his response, by affidavits or as otherwise provided in this rule, must set forth specific facts showing that there is a genuine issue for trial. If he does not so respond, summary judgment, if appropriate, shall be entered against him.

U.S.D.C. C.D. Calif. Civ. R. 3(g)(1) and (3)

Rule 3

* * *

(g) *Motions for Summary Judgment:*

1. There shall be served and lodged with each motion for summary judgment pursuant to Rule 56 of the F. R. Civ. P. proposed findings of fact and conclusions of law and proposed summary judgment. Such proposed findings shall state the material facts as to which the moving party contends there is no genuine issue.

* * *

3. In determining any motion for summary judgment, the Court may assume that the facts as claimed by the moving party are admitted to exist without controversy except as and to the extent that such facts are controverted by affidavit filed in opposition to the motion.